

1

GYPSUM BOARD MANUFACTURE WITH CO-ROTATING SPREADER ROLLER

FIELD OF THE INVENTION

This invention relates to gypsum board manufacturing, and in particular, to the manufacturer of gypsum board of the type having a low density core and higher density gypsum layers between the core and the cover sheets.

BACKGROUND OF THE INVENTION

In the manufacturer of gypsum board, whether it be wall board or ceiling board or used for some other purpose, it is desirable to use a low density gypsum to reduce the overall weight of the resulting board. The density of the gypsum can be reduced by introducing a foaming agent into the slurry that ultimately results in the core of the gypsum board. A problem with doing this, however, is that the low density gypsum does not adhere as well to the paper cover sheets that are typically used to produce the gypsum board.

One method of overcoming this adhesion problem apart from adding expensive adhesive or bond promoting agents to the gypsum slurry, is to coat the cover sheets with normal or higher density gypsum to form a bonding layer between the low density core and the paper cover sheets. Various methods have been tried to apply the higher density gypsum bonding layer to the cover sheets. One method is to spray the high density gypsum onto the cover sheets before applying the core gypsum. A difficulty with this approach, however, is that it is very difficult to get an even high density layer. The spraying apparatus is also prone to plugging problems.

Another approach is shown in the U.S. Camp Pat. No. 1,953,589. This patent shows the use of an oscillating and rotating roller that rubs the slurry into the cover sheet to make the slurry penetrate the cover sheet. The cover sheet must be backed up under the coating roller by a forming table or by a pressure roller in order for the coating roller to be able to apply sufficient pressure to rub the slurry into the cover sheet. A difficulty with this approach, however, is the high pressure required between the coating roller and the forming table or pressure roller. This creates paper break problems if foreign objects or lumps pass under the coating roller.

Another approach is to use multiple coating rollers to spread the high density gypsum over the cover sheet. An example of this is shown in the U.S. Brothers Pat. No. 2,940,505. In this patent, coating rollers bear against the cover sheets which are supported on flat table surfaces located beneath the coating rollers. A difficulty with this method, however, is that the high density gypsum tends to build up on the coating rollers. This can cause uneven coating thicknesses, or worse, lumps of partially set gypsum can form which get jammed beneath the coating rollers and cause paper breaks.

In U.S. Pat. No. 5,718,797 issued to John L. Phillips et al., the cover sheet passes beneath a counter-rotating coating roller, and a pressure roller located below the cover sheet and located upstream of the coating roller presses the cover sheet into engagement with the coating roller. The cover sheet so pressed against the coating roller causes the cover sheet to wipe the coating roller clean. While this may alleviate the problem of gypsum build up on the coating roller, there is still the problem of running the cover sheet through a high pressure nip between the coating and pressure rollers, which could cause paper breaks or other difficulties.

In the present invention, the high density layer is achieved by using a spreader roller without a backing or pressure

2

roller. The spreader roller depresses the paper sheet below the forming table, and a combination of the roller speed and the tension in the paper sheet keeps the coating roller clean.

SUMMARY OF THE INVENTION

According to one aspect of the invention, there is provided apparatus for producing gypsum board. The apparatus comprises an elongate table having an upper surface for supporting a continuously moving facing sheet thereon. The table has a transverse gap therein dividing the table into an upstream portion and a downstream portion. A transverse spreader roller is located parallel to the upper surface and has an outer surface that extends partially into the gap for depressing the facing sheet below the table upper surface. Means are provided for applying longitudinal tension to the facing sheet to control the pressure of the facing sheet against the spreader roller. Drive means rotate the spreader roller outer surface in the same direction as the facing sheet. Means are provided for depositing a coating slurry onto the facing sheet on the upstream portion of the table. The coating slurry is spread over the facing sheet by the spreader roller. Also means are provided for applying a core slurry onto the facing sheet on the downstream portion of the table on top of the coating slurry.

According to another aspect of the invention, there is provided a method of manufacturing gypsum board of the type having at least one facing sheet, a core layer of cementitious material, and an intermediate layer of bond promoting material located therebetween. The method comprises the steps of providing a forming table having an upstream portion, a downstream portion and a gap therebetween. A facing sheet is moved at a predetermined speed over the forming table passing over the gap. Bond promoting material is deposited on the facing sheet on the upstream portion of the forming table. A co-rotating spreader roller is provided in contact with the facing sheet to spread the bond promoting material over the facing sheet, the spreader roller extending into the gap. The facing sheet is tensioned so that this tension urges the facing sheet against the spreader roller. A core layer material is also applied on top of the bond promoting material on the downstream portion of the forming table.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is an elevational diagrammatic view of a preferred embodiment of a machine for producing gypsum board according to the present invention;

FIG. 2 is a plan view taken along lines 2—2 of FIG. 1;

FIG. 3 is an enlarged elevational view taken in the direction of arrows 3—3 of FIG. 2 showing another embodiment for controlling the tension in the facing sheets;

FIG. 4 is a graph showing the relationship between high density gypsum fluidity and the wet weight of gypsum in an example gypsum board produced according to the present invention;

FIG. 5 is a graph similar to FIG. 4, but shows the relationship between paper tension and the wet weight of gypsum; and

FIG. 6 is a graph similar to FIGS. 4 and 5 but shows the relationship between coating roller speed and the wet weight of gypsum.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, a preferred embodiment of a gypsum board machine according to the present invention is